REMARKS

Due to the numerous grammatical and idiomatic errors contained in the originally filed abstract and specification, Applicants are enclosing herewith a substitute abstract and specification including "clean" and "marked-up" copies. The undersigned hereby certifies, to the best of his knowledge and belief, that the enclosed substitute abstract and specification do not contain any "new matter".

In order to expedite the prosecution of the present claims, Claims 1 and 2 have been canceled and replaced by newly presented Claims 12 and 13 which more particularly point out and distinctly claim the subject matter which Applicant regards as the invention. The remaining claims have been amended in order to reflect the cancellation of Claims 1 and 2 and to correct grammatical and idiomatic errors contained therein. No new matter has been added.

Claim 5 has been rejected under 35 USC 112, second paragraph, as being indefinite. Claim 5 has been amended to overcome this rejection.

Claims 1-4 and 6-8 have been rejected under 35 USC 103(a) as being unpatentable over Shirota et al in view of Yamaguti et al. Claims 5 and 9-11 have been rejected under 35 USC 103(a) as being unpatentable over Shirota et al in view of Yamaguti et al and further in view of Su et al. Applicant respectfully traverses this ground of rejection and urges reconsideration in light of the following comments.

In compliance with Applicant's duty to disclose relevant prior art, Applicant is enclosing herewith an English-language translation of the Japanese Patent Application which published on September 12, 2000. This reference discloses the production of electrolytic water in which a direct current level of at least 1,500 coulomb per liter of water for electrolysis is used. This converts to a flow rate of less than 40mL of water per minute per ampere.

The present invention is based on the discovery that the formation of scale on a cathode and generation of sludge in alkaline water after electrolyzed alkaline water and untreated water are mixed in lines and tanks can be avoided by restricting the water flow rate to the cathode compartment of 40mL/min. per ampere of current and feeding softened water to the cathode chamber.

That is, a first embodiment of the present invention is directed to a method of producing acidic and alkaline electrolyzed water. This method comprises the steps of providing an electrolyzer having an anode chamber containing the anode and a cathode chamber containing the cathode separated by a diaphragm, feeding softened water to the cathode chamber and unsoftened water containing an electrolyte to the anode chamber, and performing electrolysis in the electrolyzer to produce acidic and alkaline electrolyzed water. The flow rate of the softened water to the cathode chamber is no greater than 40mL/min. per ampere of loading current.

Another embodiment of the present invention is directed to a method of producing acidic and alkaline electrolyzed water. This method involves the steps of providing an electrolyzer having an anode chamber containing an anode, a cathode chamber containing a cathode and an intermediate chamber separated from the anode chamber by a first diaphragm and the cathode chamber by a second diaphragm, providing unsoftened water containing an electrolyte into the intermediate chamber and feeding softened water to the cathode chamber and unsoftened water to the anode chamber, and performing electrolysis in the electrolyzer to produce acidic and alkaline electrolyzed water. The flow rate of the softened water to the cathode chamber is no greater than 40 mL/min. per ampere of loading current.

As stated above, the present invention is based on the discovery that the combination of controlling water fed to the cathode chamber at no greater than 40mL/min. per ampere of

loading current and feeding softened water only to the cathode chamber enables the electrolyzer to be operated such that no scale deposits on the cathode during the electrolysis process and the precipitation of sludge or scale in lines or tanks after electrolyzed alkaline water is mixed with untreated water can be prevented. This is clearly not shown by the prior art cited by the Examiner.

The Shirota et al reference discloses a manufacturing method and apparatus for making alkaline ionized water and acidic water. This reference discloses that a supplying system 7a of raw material water for producing acidic water is connected to the anode cell 2a and water selected for water for industrial use, tap water and well water is supplied from it to the anode cell. As shown in Figure 1-A, the cathode compartment 2c is fed alkaline ionized water from a container bath 4 with a raw material water make-up through line 7a'. The alkaline ionized water supplied to the cathode compartment is recirculated from the cathode compartment and discharged out of line 9a when a desired pH value has been obtained. In contrast to the Examiner's position, this reference has no disclosure with respect to the introduction of softened water as the feed liquid into the cathode chamber, only recirculated alkaline ionized water.

The Yamaguti et al reference disclosed a method for producing electrolyzed water by varying the ratio between the flow rate of water into the cell and the applied current to obtain electrolytic water having a desired pH value. However, the reference has no disclosure with respect to feeding softened water to the cathode compartment or regulating the flow rate of water into the cathode compartment to the claimed upper limit to avoid the formation of scale on the cathode and subsequent formation of scale and sludge in lines and tanks after the electrolyzed alkaline water is mixed with raw water after the electrolysis. As such, it is respectfully submitted that the combination of Shirota et al with Yamaguti et al does not even present a showing of prima facie obviousness

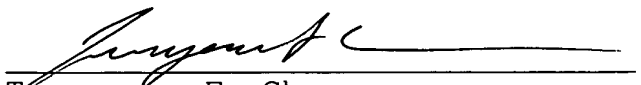
under 35 USC 103(a) with respect to the presently claimed invention.

The Su et al reference has been cited by the Examiner as disclosing a method of producing electrolyzed water in which the desired pH is between 2 and 4. However, this reference contains no suggestion regarding the feeding of softened water to the cathode along with controlling the flow rate of the water fed to the cathode at the claimed upper limit and the advantages associated therewith. Therefore, this reference adds nothing to the previously discussed references.

Although the Examiner has not made a showing of prima facie obviousness with respect to the presently claimed invention, objective evidence is of record in the present specification which is more than sufficient to rebut any proper showing of prima facie obviousness under 35 USC 103(a). On pages 9-12 of the present specification, an example of a process operated according to the claimed parameters is compared with comparative processes which are operated outside of the scope of the present claims. That is, in Comparative Example 1, the flow rate of the water introduced into the cathode compartment was higher than the claimed upper limit and in Comparative Example 2, unsoftened water was fed to the cathode compartment. The remaining process parameters in the Comparative Examples were the same as that of Example 1. As discussed in Comparative Example 1, after 48 hours of operation, it was impossible to continue electrolysis due to high voltage occurring from scale being formed on the cathode. As shown in Table 1 on page 12 of the present specification, and in Comparative Example 2, a much larger amount of precipitate was formed in comparison with Example 1 and the filtering time for the alkaline electrolyzed water produced in Comparative Example 2 was more than seven times longer than that of Example 1. This is clearly unexpected in light of the prior art cited by the Examiner and establishes the patentability of the presently claimed invention thereover.

The Examiner is respectfully requested to reconsider the present application and to pass it to issue.

Respectfully submitted,



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